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STSC, Inc.

APL★PLUS® News

New Releases Expand APL★PLUS Product Line

Late summer and fall saw the release of three new versions of APL★PLUS. With these new releases, the extensive capabilities of APL now reach across more hardware environments than ever before. Now, whether you use a mainframe, minicomputer, or microcomputer, you can put APL★PLUS to work for you.

- *Users of VAX/VMS computers now have the power of APL★PLUS at their fingertips.*
- *PC enthusiasts are now using APL★PLUS PC Release 7.0 in that popular environment.* *(see page 6)*
- *Mainframe users now have available Release 6.0 of APL★PLUS Mainframe which incorporates several exciting new features.* *(see page 8)*

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APL★PLUS VAX/VMS—Powerful Software for a Powerful Computer

The APL★PLUS System for VAX/VMS computers, released in late August, has been enthusiastically received by the DEC community.

STSC has just enhanced the value and computing power of the VAX line while introducing some 90,000 VAX users to APL★PLUS, an unrivaled productivity and application development tool. There are presently only two APL products serving this marketplace—STSC's and DEC's. What distinguishes STSC's APL★PLUS is its treatment of advanced features such as nested arrays, APL component files, and terminal interfaces allowing full-screen interactive development and applications.

Outside Interface Feature

This new APL★PLUS System allows the VAX user to access a wide variety of non-APL programs: database managers, full-screen forms input processors, graphics packages and others.

With ⎕NA, subroutines in compiled languages like C or FORTRAN are quickly called up as if they were regular APL functions. And, with ⎕CMD and)CMD, VMS DCL commands are executed from the APL environment.

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APL★PLUS *News*

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Announcing . . .

APL Consulting Services—Getting You the Answers

You want to license an APL★PLUS product but hesitate. Why? Because you are converting from VSAPL, APL2, non-IBM APL, a non-APL micro application, or a non-APL mainframe application. Or, you have an APL★PLUS application on an IBM PC or mainframe and you would especially like to run it on all of your VAX machines.

The Solution: Use STSC's APL Consulting Services. We offer a wide range of expertise in converting applications from many different environments. We specialize in tying all of your application's elements together using APL★PLUS enhancements to handle input, output, and mainframe-to-micro communications.

You have a great idea for a new micro product or in-house system that will significantly increase your company's productivity. You have experts to handle the application logic and to code that logic into APL, but you lack the experience or just the time to put a front-end on the system.

The Solution: STSC Consulting Services can help you complete your project by providing a front-end for your application. Working with you, we will create screens for user input, reports, or graphics for user output so that your company *and* your users benefit from the application.

STSC Consultants Complete Insurance Project

We recently completed a consulting project for a large insurance company developing a rate quotation system. Our client designed the overall system but lacked the manpower and the expertise to develop the system's front end. That company's APL staff coded the algorithms and worked with STSC consultants to develop a specification for the system's front-end. We then designed and coded a solution for all required screens, user input validation, and database mechanism. With STSC's special expertise, the insurance company met its deadline to send the application out to its user base.

STSC's consultants will work with you to design or enhance any APL application. We can provide assistance every step of the way or create a solution based upon the work you've already accomplished.

For more information on just how STSC Consulting can make you more productive, please call Steven Promisel directly at (301) 984-5329 or 1-800-638-6660.

APL—Not Enough Interest for *PC Magazine*

Now is the time for all APL users to come to the aid of their language! *PC Magazine* has launched a new column ,"Languages," which encourages readers to share their knowledge of BASIC, C, Pascal, FORTRAN, and COBOL.

Many *PC Magazine* readers are missing out on information about of one of the most powerful languages available: APL.

When asked about this omission, the editor of the column, Robert Hummel, said he did not feel there were enough users or interest among his readers to merit the inclusion of APL in his column. We can prove him wrong!

Send your APL applications to Mr. Hummel today and let him know that APL is indeed important and merits inclusion in his column. Enough letters to *PC Magazine* could change Mr. Hummel's mind and possibly make "Languages" a national public forum for the exchange of ideas and thoughts about APL.

Mr. Robert Hummel
Senior Technical Editor
Languages
PC Magazine
One Park Avenue
New York, NY 10016

STSC's APL★PLUS Applications Story Contest

STSC recently announced the winners of the contest to find unique applications that use APL★PLUS. We received entries from across the country that described applications such as: annual and mean environmental water budgeting, construction management, law enforcement exam grading, sales support, and state lottery game design. Winners received cash awards and software.

First Place

APL★PLUS Tests Accuracy in Chip Production

The first place entry was submitted by Mr. Abijah Reed, Senior Engineer/Scientist for GCA Corporation in Andover, Massachusetts. GCA designs and builds equipment used in the manufacture of wafers to be used in computer chips and other micro circuits.

The application simulates the assembling of a machine from its component parts and then automatically performs a tolerance analysis on the assembled machine.

Mr. Reed states, "The problem is to predict how an ultra-precise machine will work before it is built. It is also necessary to study the effects of inevitable small manufacturing and fabricating errors. How will these dimensional tolerances affect the machine's performance?"

"I selected APL★PLUS PC because the application lends itself beautifully to treatment with matrices and vector algebra...and because there were to be many interacting modular routines. The speed of program development with APL★PLUS PC, especially with its many system functions and debugging capabilities, made it virtually the only choice."

Other Applications

"Texas-Size" Savings for Houston Construction Company

Another prize winner was Mr. Maurice Sumner of Houston, Texas. He used APL★PLUS PC to perform manufacturing plant equipment condition monitoring and predictive maintenance system design for M.W. Kellogg, a Texas engineering and construction company.

Mr. Sumner's application ". . . automates and unifies data gathering, reporting, tabulation, and prediction of equipment maintenance parameters such as vibrations, temperatures and defect measurements. The program is the first step in a system expected to save perhaps hundreds of thousands of dollars per day."

"The product is being demonstrated to other manufacturers, principally in the process (chemical-petrochemical) industries, and is being well-received. No other such program exists in the market, " Sumner says.

Unsuccessful attempts were made by others using Pascal and dBASE over an eighteen-month period to build the same system that Sumner wrote in less than one-third the time!

Congratulations to all our winners:

Abijah Reed	Doug Draeseke
Rod Pullman	Ron Geiss
Maurice Sumner	Troy Shinbrot
Raoul LePage	

More to Come

APL★PLUS *News* will be bringing you more of our application stories in future issues. If you have a unique application using APL or APL★PLUS, write us today, and we'll share it with the rest of our readers.

"The speed of program development with APL★PLUS PC, especially with its many system functions and debugging capabilities, made it virtually the only choice."

APL '88 Conference in Australia

Plan now to be at the International APL Conference February 1-5, 1988 in Sydney, Australia. The Conference is being organized by the Sydney APL users group in cooperation with ACM and SIGAPL and will be an official event of the Australian Bicentennial Year. APL '88 will be held at the University of Sydney during the week following the main celebrations of Australia's Bicentennial.

PC Treasure Chest

by Ralph Fox

An impressive new feature of the APL★PLUS PC System, Version 7.0 is the Virtual Workspace Mode.

When invoked with the VWS= sign-on parameter, the APL system will automatically manage all of the swapping of workspace functions and variables in and out of an auxiliary storage file. Only those named objects larger than a specified "granularity" are eligible for swapping. Thus, despite the constraint that any one function, variable, or temporary must still fit within the 640KB RAM limitation, Virtual Workspace Mode can be a valuable workspace expander.

The operation of Virtual Workspace Mode is designed to be completely transparent to the user. You need not be concerned whether a particular object is swapped or not. The system uses an aging algorithm in deciding what should get swapped out, and it will always swap objects in when they are referenced. Since you may succumb to a curiosity about how VWS manages an application, the following examples show some details, allowing you to relax and let APL do the swapping for you.

The two referenced subroutines, VWSINFO and INWS, are utilities from the distributed VIRTMODE workspace.

First, define a function to report storage availability in the "real" workspace (⎕WA) and the auxiliary file:

```
    ∇ R←STORAGEINFO;A
[1]   R←'⎕WA = ',⍕⎕WA
[2]   A←¯2↑VWSINFO
[3]   R←R,'; Granules: ',(⍕-/A),' taken, '
[4]   R←R,(⍕¯1↑A),' free'
    ∇
```

Then define a function to report which objects are currently swapped out of the real workspace:

```
    ∇ ΔR←SWAPPED;ΔA;ΔB;ΔG;ΔS
[1]  ⍝ List of swapped fns and vars, with sizes
[2]   ΔR← 0 0 ⍴'' ⍝          empty mat if no VWS
[3]   →(0=ΔG←1↑VWSINFO)⍴0 ⍝ get granularity
[4]   ΔS←⎕SIZE ΔR←⎕NL 2 3 ⍝ size of fns & vars
[5]   ΔB←ΔS≥ΔG×1024 ⍝       which swappable?
[6]   ΔA←~INWS ΔR←ΔB⌿ΔR ⍝   which swapped?
[7]   ΔR←ΔA⌿ΔR ⍝            their names
[8]   ΔS←ΔA/ΔB/ΔS ⍝         their sizes
[9]   ΔR←ΔR,' ','VF'[2 3 ⍳⎕NC ΔR],'I7' ⎕FMT ΔS
    ∇
```

And finally, define a sample function to combine both reports:

```
    ∇ INFO
[1]   STORAGEINFO
[2]   'Swapped:'
[3]   SWAPPED
    ∇
```

Next, run the INFO function in a workspace where nothing is swapped, the granularity is 2K for a 400K workspace VWS file, and there is present a function between 2K and 4K in size, for which space is reserved in the VWS file. Space is held in case it needs to be swapped out in order to complete a calculation or to swap in some other objects such as:

Continued on page 5

```
      )VARS

      INFO
⎕WA = 142912; Granules: 2 taken, 198 free
Swapped:
```

Now, create some variables to decrease ⎕WA:

```
      A←⍳20001
      B←⍳20002
      C←⍳20003
      INFO
⎕WA = 22736; Granules: 62 taken, 138 free
Swapped:
```

Nothing has yet been swapped, but space in the virtual file is set aside for these new variables. The next variable will trigger some swapping.

```
      D←⍳20004 ⋄ INFO
⎕WA = 25392; Granules: 82 taken, 118 free
Swapped:
C             V  40016
VWSINIT       F   2672
```

Next, create another variable that will not fit in the real workspace. Since objects larger than the new variable get swapped, ⎕WA actually increases!

```
      E←⍳15005 ⋄ INFO
⎕WA = 35408; Granules: 97 taken, 103 free
Swapped:
C             V  40016
D             V  40032
VWSINIT       F   2672
```

Even though objects are swapped out, they are still accessible to APL expressions. Here, the system swaps out A and E in order to evaluate C and D:

```
      (⍴B),(⍴C),⍴D
20002 20003 20004
      INFO
⎕WA = 25408; Granules: 97 taken, 103 free
Swapped:
A             V  40016
E             V  30032
VWSINIT       F   2672
```

But, four of these hefty variables won't fit in RAM at the same time for a computation like:

```
      (⍴A),(⍴B),(⍴C),⍴D
WS FULL
      (⍴A),(⍴B),(⍴C),⍴D
      ^
```

It is usually easy to perform such a computation by partitioning it into swappable "chunks":

```
      TEMP←(⍴A),⍴B ⋄ ⎕←TEMP,(⍴C),⍴D
20001 20002 20003 20004
      INFO
⎕WA = 25264; Granules: 97 taken, 103 free
Swapped:
B             V  40016
E             V  30032
VWSINIT       F   2672
```

Erasing swapped objects frees up granules in the auxiliary file, but it does not trigger any in-swapping:

```
      )ERASE A B C D
      INFO
⎕WA = 145344; Granules: 17 taken, 183 free
Swapped:
E             V  30032
VWSINIT       F   2672
```

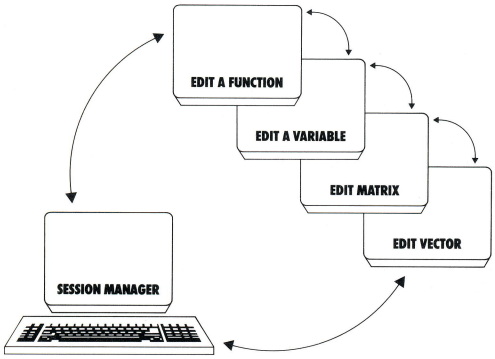
You can cause objects to be swapped in just by referencing them:

```
      TEMP←⍴E ⋄ TEMP←⍴⎕VR 'VWSINIT'
      INFO
⎕WA = 112640; Granules: 17 taken, 183 free
Swapped:
```

What is the performance penalty for using Virtual Workspace Mode? By placing the auxiliary file on a RAM disk, using Virtual Workspace Mode is actually quite comparable to running your application in a larger, very full, "real" workspace, where APL performs frequent garbage collection. And, VWS can allow you to run some applications that otherwise would be extremely difficult to run without it.

Ralph Fox is Product Development Manager for APL★PLUS PC products. Call Ralph if you have questions about Virtual Workspace Mode or any other APL★PLUS PC feature.

Full-Screen Editor



Create, view, and edit multiple functions and variables—simultaneously.

Other features include: easy report generation, improved error and exception handling, and a new monitor facility. For more information about the many powerful features available for VAX/VMS users, call Jerry Turner at (301) 984-5112.

APL★PLUS PC System 7.0 A Cure for Memory Headaches

For APL users with a wealth of data and computations and no place to put them, STSC introduces the APL★PLUS PC System, Version 7.0. This update has two innovative enhancements that increase the effective workspace size — virtual workspace mode and Lotus/Intel Expanded Memory Specification support. Now you can get more work area when you need it and handle larger and more complex problems than ever before.

Expanding the Workspace

The Virtual Workspace allows the transfer of items in and out of the workspace as needed, freeing valuable memory for the task at hand. This capability stretches the workspace size beyond 640K. Previously, workspaces were limited to the available memory. The virtual workspace feature allows objects to be swapped in and out to a RAM disk or a hard disk file and automatically manages the process.

Expanding the workspace even further, Version 7.0 support for the Lotus/Intel Expanded Memory Specification provides access to an additional 64K of memory. A portion of the APL interpreter can be installed in the Lotus/Intel memory area to provide access to an extra 64K of real memory for data and programs, without any speed degradation.

Optimizing Function Execution Time

A new system function, □MF, provides the user with vital information on where to optimize function execution time. It reports on the time spent on a line of code and the number of times that line is called. Also provided is a high resolution timer for IBM PCs and compatibles, and a the MFFNS companion workspace of reporting functions.

Network Support

With the increasing power of PCs and the growing sophistication of PC applications, users have an increased need to share data and programs via networks. APL★PLUS PC 7.0 has standard DOS 3.1 network file capabilities. Most popular networks provide support for these new APL features including: Novell, 3COM, IBM PC Net, and IBM Token Ring.

New Graphics Facility

This feature includes an APL interface to GSS★CGI graphics drivers, the industry-standard drivers provided by Graphic Software Systems. You can now build applications that will produce graphics output on over 100 devices, including screen adapters, laser printers, plotters, and film recorders. Additionally, you can write your graphics to "metafiles" for transfer to other applications that accept metafile format.

Additional features include:

- additional/enhanced assembler functions
- speedups to several primitive functions and faster garbage collection
- a □WIN tutorial with a companion workspace of graphics utilities and sample functions
- support for the 101-key keyboard, AT lights, and 80386-based computers
- improved □FMT, □WIN, □LIBD, □SA, and □ARBIN
- revised HELP
- new quick reference guide and user documentation.

The APL★PLUS PC System runs on the IBM PC, XT, AT, PS-2 and compatible microcomputers with a monochrome, color, EGA, or VGA display adapter. One double-sided disk drive, 384K RAM, and DOS 2.0 or later are required. A hard disk, 640K, and math coprocessor are recommended. For network support, DOS 3.1 or later is required.

The suggested retail price of APL★PLUS PC in the U.S. and Canada is $695. Upgrades are

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APL Press, A New Addition

STSC has added *APL: Advanced Techniques and Utilities* by Gary Bergquist to the list of books carried by APL Press. This new publication is an advanced APL text designed to enhance the skills of the already accomplished programmer through a variety of problem-solving exercises. Techniques promoting productivity are emphasized, with more than 200 proven utility functions listed in the book and available on diskette.

To order this publication or to receive the entire list of available books from APL Press, call Lisa Dietrich at (301) 984-5125.

APL Education

Learn the Basics or Fine-Tune Your Skills

The number of APL professionals who have taken advantage of STSC's Educational Services is constantly growing. Our APL courses are designed to build your skill level and enhance your ability to solve daily business problems utilizing the full power of APL. Our classes are shaped, in part, by the students who enroll in them. From student evaluations and specific requests, we have molded courses that benefit both the APL novice and experienced programmer. In response to client requests, we recently added a course specifically for system administrators.

A regular slate of classes is held at STSC's training facility in Rockville, Maryland. Training is also available at client facilities and regionally convenient locations. Conducting classes at client sites is proving to be a very popular and cost-effective way for a number of individuals at one company to brush up on the basics or to learn advanced concepts and methods.

Mary Poland, Corporate Development Actuary for Standard Life Assurance Company, commented on a class held recently in Montreal, "We are very pleased. Students entering the course had varied levels of APL experience. The material was generally new for them, but it was well-paced, presented clearly with relevant examples, and supplemented with excellent reference materials for individual review."

Classes are scheduled in metropolitan Washington, DC and suburban Los Angeles during the first three months of 1988. Call Bonnie Hardy at (301) 984-5131 or 1-800-638-6660 to receive a free updated course catalog and to enroll in the course that fits your needs.

APL Courses
January - March '88

Introduction to APL
January 4-8, Costa Mesa, CA
January 25-29, Rockville, MD

Intermediate APL
March 7-11, Costa Mesa, CA
March 28-April 1, Rockville, MD

Advanced APL with Applications Development
Please call STSC for details.

APL★PLUS Mainframe Enhancements
February 22-24, Rockville, MD

APL★PLUS Compiler
February 17-19, Rockville, MD

STSC Client Conference Announced

Planning is underway for STSC's Client Conference. In response to numerous requests, STSC is designing a forum for clients, software engineers, and product managers to address timely issues and events. This Conference will also serve as a chance to network with other professionals and to share ideas and experiences.

Activities at the Client Conference will be led by individuals from various parts of STSC and also by some of our clients. Attendees will learn about STSC's plans from company executives. Key members of our development staff will lead in-depth discussions about product features and applications. And, most important, our clients will lead special interest activities and discussions.

Everyone will have the opportunity to participate in question/answer sessions, present views, discuss needs, and share solutions.

The STSC Client Conference will be held in the Washington, DC area in the fall of 1988. Details about the Conference will follow shortly. To ensure that you are kept abreast of this event, call Bonnie Hardy at (301) 984-5131 or 1-800-638-6660.

Complete the enclosed reply card and let us know what would be of interest to you and your availability to lead a discussion. This event promises to be both educational and enjoyable for all. We look forward to meeting you here.

available starting at $150. Call (301) 984-5129 or 1-800-592-0050 for information on updating older versions. Clients outside the United States should call (301) 984-5412.

HELPLINE support for versions of APL★PLUS PC prior to 7.0 will be discontinued after April 30, 1988.

APL★PLUS Mainframe Release 6.0

The new version of the APL★PLUS and SHAREFILE Systems for mainframe computers was released in August, 1987. This new release contains a number of enhancements that will help both end-users and system administrators.

Included in Release 6.0 are:

- a user command processor that allows you to create your own system commands
- an automatic global error handling facility
- a function for illustrating the structure of nested arrays
- an enhanced format function that accepts nested and mixed arguments
- improved SHAREFILE Administrator tools

APL★PLUS Mainframe users currently covered by a maintenance agreement will automatically receive the Release 6.0 update. For APL★PLUS Mainframe information or to find out about upgrading your present system, call Jerry Turner at (301) 984-5112 or 1-800-638-6660.

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